

We claim:

1. A computer-implemented method for constructing a composite image representing an item viewed under a microscope at a plurality of focal planes, the method comprising:
  - 5 with a camera viewing the item under the microscope, capturing a plurality of images from a capture area for the plurality of focal planes;  
for the plurality of focal planes, within a set of images in a same focal plane, identifying locations at which adjacent images in the same focal plane can be joined;  
for the plurality of focal planes, joining the adjacent images in the same focal  
10 plane at the identified locations into a composite image for the focal plane; and  
storing the plurality of composite images for the plurality of focal planes in a format retrievable by image browsing software.
- 15 2. The method of claim 1 wherein the item is a biological sample.
3. The method of claim 1 wherein the item is a biological sample prepared for conducting a Pap test.
4. The method of claim 1 further comprising:
  - 20 combining pixel characteristics for the plurality of images into a corrective filter; and  
applying the corrective filter to the plurality of images.
5. The method of claim 1 wherein the plurality of composite images are  
25 stored in a single file.
6. The method of claim 1 wherein the composite images are of a first magnification, the method further comprising:
  - for the composite images, generating composite images of a second  
30 magnification less than the first.

7. The method of claim 1 further comprising:  
combining pixel characteristics for the plurality of images into a corrective  
filter; and  
with the corrective filter, removing color shift from the plurality of images.

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8. The method of claim 7 wherein the corrective filter is an image of a  
same size as the plurality of images.

9. The method of claim 8 wherein the corrective filter is a two-  
10 dimensional array of red, green, and blue correction values.

10. A computer-readable medium comprising computer-executable  
instructions for performing the method of claim 1.

11. The method of claim 1 further comprising:  
collecting z location readings for a plurality of locations in the capture area  
indicating a uniform z location with respect to the item at each location; and  
during capturing, automatically adjusting z location of the microscope  
according to the z location.

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12. The method of claim 11 wherein automatically adjusting z location  
comprises:

finding at least three near readings to a current location of the microscope;  
and

25 interpolating a proper z location of the microscope by finding a point relating  
to the current location on a plane defined by the at least three near readings.

13. The method of claim 11 wherein  
the z location readings are collected for a single focal plane; and  
30 during capturing, z location of the microscope is adjusted for a plurality of  
focal planes according to the z location readings.

14. A computer-implemented method of browsing a composite image representing an item viewed under a microscope, wherein the composite image comprises a set of composite image portions, the method comprising:

- 5 decompressing the composite image portions of the composite image for a browsing area currently being browsed at a computer;  
displaying at least portions of the decompressed images; and  
decompressing composite image portions of the composite image that are outside the browsing area currently being browsed and likely to be next displayed during navigation of the composite image.

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15. The method of claim 14 wherein the item is a biological sample.

16. The method of claim 14 further comprising:

- 15 loading into memory at least one complete composite image for a focal plane in compressed form.

17. The method of claim 14 further comprising:

- loading into memory complete composite images for plural focal planes in compressed form.

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18. The method of claim 14 wherein the composite image portions likely to be next displayed are composite image portions adjacent to and in a same focal plane as composite image portions currently being displayed.

- 25 19. The method of claim 14 wherein the composite image portions likely to be next displayed are composite image portions adjacent to composite image portions currently being displayed and in a different focal plane.

20. The method of claim 14 wherein

- 30 displaying is performed by a first thread; and  
decompressing images likely to be next displayed is performed by a second thread.

21. The method of claim 14 further comprising:  
in preparation for displaying at least portions of the decompressed images,  
loading the decompressed images directly into video memory;  
5 tracking which images are loaded into video memory;  
tracking when images loaded into video memory were last used; and  
keeping images in video memory until display of an image requires  
discarding an image, wherein the least recently used image is discarded.
- 10 22. A computer-readable medium comprising computer-executable  
instructions for performing the method of claim 14.
23. A system for constructing a composite image representing an item  
viewed under an automated microscope at a plurality of focal planes, the system  
15 comprising:  
an automated microscope with a computer-controllable stage and focus  
controls;  
a computer system interfaced to the automated microscope;  
a camera positioned on the microscope and operable to send a photographic  
20 representation of a microscopic view of the item to the computer system for capture;  
software running on the computer system and operable to navigate the  
microscope to a plurality of locations at a plurality of focal planes, and capture  
images via the camera; and  
software operable to integrate the images into composite images for a  
25 plurality of focal planes.
24. The system of claim 23 wherein the item is a biological sample.

25. A system for constructing a composite image representing an item viewed under an automated microscope at a plurality of focal planes, the system comprising:

- an automated microscope with a computer-controllable stage and focus
- 5 controls;
- a computer system interfaced to the automated microscope;
- means positioned on the microscope and operable to send a photographic representation of a microscopic view of the item to the computer system for capture;
- means for navigating the microscope to a plurality of locations at a plurality
- 10 of focal planes, and capture images via the camera; and
- means for integrating the images into composite images for a plurality of focal planes.

26. The system of claim 25 wherein the item is a biological sample.

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27. A browsing system for displaying composite images comprising a set of compressed images forming portions of the composite images, the system comprising:

- variables for tracking the current browsing area;
- 20 a composite image manager for providing access to the portions of the composite images:
- a decompression cache manager for tracking pre-decompressed images;
- a decompressed image store for storing decompressed versions of the portions of the composite images;
- 25 a video memory cache manager for tracking which of the decompressed versions of the portions of the composite images are currently loaded in video memory.

28. The browsing system of claim 27 wherein the composite image

30 manager maintains a store of composite images for a plurality of focal planes.

29. The browsing system of claim 27 wherein the composite image manager maintains in memory a store of at least one complete composite image in compressed form.

5 30. The browsing system of claim 27 wherein the composite image manager maintains in memory a store of a plurality of complete composite images for a plurality of focal planes in compressed form.

31. The browsing system of claim 27 wherein the decompression cache  
10 manager prioritizes decompression according to the following, ordered priority:  
image portions for the current browsing area;  
image portions in a same focal plane and adjacent to the current browsing  
area; and  
image portions in a different focal plane and adjacent to the current browsing  
15 area.

32. A browsing system for displaying composite images comprising a set  
of compressed images forming portions of the composite images, the system  
comprising:  
20 means for tracking the current browsing area;  
means for providing access to the portions of the composite images;  
means for tracking pre-decompressed images;  
means for storing decompressed versions of the portions of the composite  
images;  
25 means for tracking which of the decompressed versions of the portions of the  
composite images are currently loaded in video memory.

33. A computer-readable medium comprising the following data structures:

a set of values indicating a current location being browsed within a set of composite images at a plurality of focal planes;

5 a set of composite image portions in the form of compressed images and representing portions of the composite images in a plurality of focal planes; and

a subset of the composite image portions in decompressed form, wherein the subset comprises images likely to be next browsed.